Oct-2014

Seat Number

कोकीळा - 031 / 032

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MATHEMATICS PAPER - III : MTH-113
(A) Co-Ordinate Geometry (11117) OR / (B) Graph Theory (11118)

P. Pages : 7

(A) Co-Ordinate Geometry (11117)

Time : Two Hours **Max. Marks : 40**

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory.
5. Figures to right indicate full marks.
6. Use of calculators is not allowed.

1. Attempt **any eight.** **8**

i) Find the new coordinates of the point (2,-3) with respect to the new origin (1, -2).

ii) State the formulae for rotation of axes.

iii) What are the conditions that the equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents parabola.

iv) Write the centre of the sphere $2x^2 + 2y^2 + 2z^2 - 8x - 4y + 7 = 0$.

v) State the condition that two spheres cut orthogonally.

vi) Find the equation of the sphere with centre (-1, 0, 2) and having radius 3.

vii) Define a cone.

viii) What is the vertex of the cone represented by the homogeneous equation in x, y and z.

ix) Find the direction cosines of the generators of the right circular cylinder whose axis is $\frac{x}{2}=\frac{y}{3}=\frac{z}{5}$.

x) Define Enveloping cylinder of a sphere. 6

2. a) Attempt **any two.**

i) If the origin is shifted at (h, -2), the transformed equation of locus $3x^2+4x-2y+7=0$ doesnot contain the first degree term in x then find the value of h.

ii) Obtain the formula for an angle θ, through which the axes should be rotated so that the transformed equation of the locus $ax^2+2hxy+by^2=0$ becomes free from the term in xy.

iii) Identify the conic and find the centre of the conic represented by $x^2-xy+y^2+4x-5y-2=0$.

b) Write the equations of rotation of axes when the axes are rotated through an angle $\theta=\tan^{-1}(-\frac{1}{2})$. 2

8

3. Attempt **any two.**

i) Derive the equation of the sphere in the centre radius form and prove that $x^2+y^2+z^2+2ux+2vy+2wz+d=0$ represents a sphere.

ii) Find the equation of the sphere with centre at (-1, 3, 4) and passing through the point (-2, -1, 3).

iii) Find the equation of tangent plane and normal line to the sphere $x^2+y^2+z^2+4x-5y-3z-3=0$ at (1, 2, -1) on it.

6

4. a) Attempt **any two.**

i) Derive the equation of the right circular cone with semi-vertical angle θ, vertex (α, β, γ) and having axis whose direction ratios are a, b, c.

ii) Find the equation of the cone which passes through three axes and the lines $\frac{x}{2}=\frac{y}{1}=\frac{z}{3}$ and $\frac{x}{-3}=\frac{y}{1}=\frac{z}{2}$.

iii) Find the equation of right circular cone with vertex at (1,2,-3), semivertical angle $\cos^{-1}\left(1/\sqrt{3}\right)$ and direction ratios of axis as 1,1,0.

b) Find the equation of the cone with vertex at (0,0,0) and which passes through the curve given by $2x^2+3y^2=z;\ x+y=1$. 2

5. a) i) Find the equation of the cylinder whose generators intersect the guiding curve $f(x,y,z)=0;\ ax+by+cz+d=0$. 4

ii) Find the equation of the right circular cylinder with radius 2 and having axis $\frac{x-1}{2}=\frac{y}{3}=\frac{z-3}{1}$. 4

OR

a) i) Obtain the equation of cylinder whose generators are parallel to $\frac{x}{1}=\frac{y}{-2}=\frac{z}{3}$ and having guiding curve $x^2+2y^2=1;\ z=3$. 4

ii) Find the equation of enveloping cylinder of a sphere $x^2+y^2+z^2=a^2$ whose generators are parallel to $\frac{x}{\ell}=\frac{y}{m}=\frac{z}{n}$. 4

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(B) Graph Theory (11118)

Time : Two Hours **Max. Marks : 40**

Instructions to Candidates :

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4. All questions are compulsory.
5. Figures to the right indicate full marks.
6. Use of calculator is not allowed.

1. Attempt **any eight** of the following. **8**

i) Define complete graph.

ii) In any graph, the number of odd vertices is

a) odd b) even
c) prime d) none of these

iii) Define complement of graph.

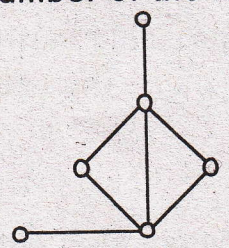
iv) A complete graph $K_{m,n}$ is Eulerian iff

a) m and n are odd b) m is odd and n is even
c) m and n are even d) None of these

v) Define a bridge.

vi) State Euler formula for planar graph.

vii) Determine chromatic number of the following graph.



viii) When the complete graph K_n is a tree. Write the value of n.

ix) Define 'centre of tree'.

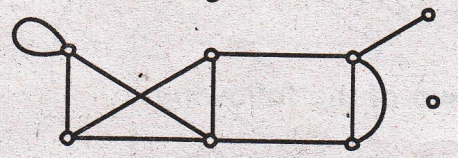
x) If G is a graph on p vertices with q edges and K components then what is rank of G ?

2. a) Attempt **any two** of the following. **6**

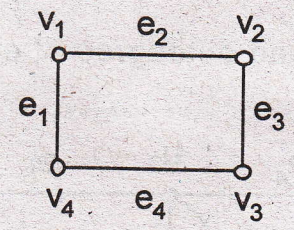
i) Prove that the maximum number of edges in a simple graph on n vertices is $\frac{n(n-1)}{2}$.

ii) Determine the number of edges in a graph with 6 vertices, 2 of degree 4 and 4 of degree 2. Draw such graph.

iii) State and verify Handshaking Lemma for following graph.



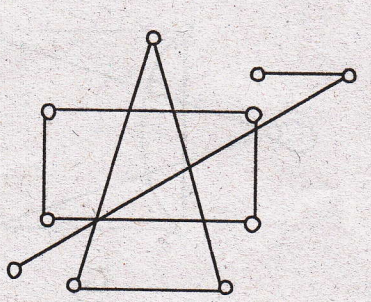
b) Draw five subgraph of the following graph. **2**

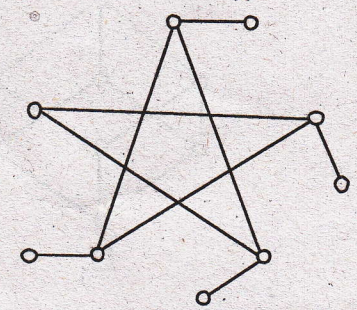


3. Attempt **any two** of the following. **8**

i) Write a note on the travelling salesman problem.

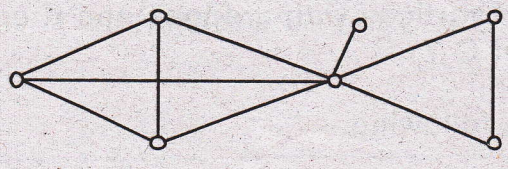
ii) Are the following graphs connected ?
If it is disconnected find components of the graph.



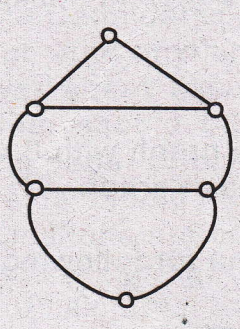


iii) Find K(G), $\lambda(G)$ and $\delta(G)$ for graphs given below

a)



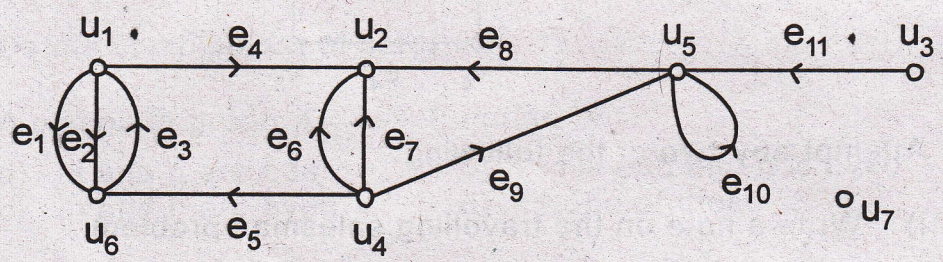
b)



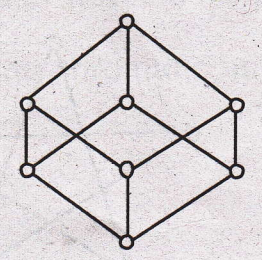
4. a) Attempt **any two** of the following. **6**

i) Let G be a 2-connected planar graph without a triangle and if G has p vertices, q edges then prove that $q \leq 2p-4$.

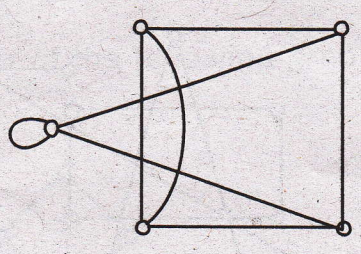
ii) Find indegree and outdegree of each vertex in following diagraph.



iii) Are the following graphs G_1 and G_2 are planar ? Justify.



G_1



G_2

b) Find the number of vertices of a graph with 16 edges and faces 9. **2**

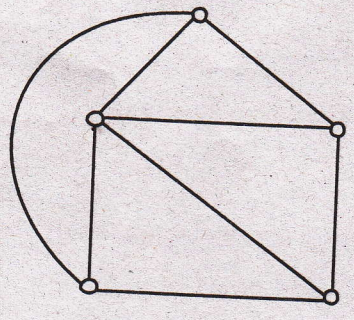
5. a) i) Prove that a tree with n vertices must have (n-1) edges. 4

ii) A tree has two vertices of degree 2, one vertex of degree 3 and 3 vertices of degree 4. How many number of vertices of degree 1 does it have ? 4

OR

a) i) Prove that a graph with n vertices, n-1 edges that has no circuit is a tree. 4

ii) Draw the spanning trees of the following graph. 4



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